Import an online automobile dataset into Python and Explore

```
# If you are running the lab in your  browser, install the libraries using ``piplite``
import piplite
import micropip
await piplite.install(['pandas'])
await piplite.install(['matplotlib'])
await piplite.install(['scipy'])
await piplite.install(['seaborn'])
await micropip.install(['ipywidgets'],keep_going=True)
await micropip.install(['tqdm'],keep_going=True)

# If you run the lab locally using Anaconda, you can load the correct library and versions by
uncommenting the following:
#install specific version of libraries used in  lab
#! mamba install pandas==1.3.3  -y
#! mamba install numpy=1.21.2 -y

# import pandas library
import pandas as pd
import numpy as np

#Download the dataset into your browser

from pyodide.http import pyfetch

async def download(url, filename):
    response = await pyfetch(url)
    if response.status == 200:
        with open(filename, "wb") as f:
            f.write(await response.bytes())

# Read the data
path =
"https://cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud/IBMDeveloperSkillsNetwork-DA
0101EN-SkillsNetwork/labs/Data%20files/auto.csv"
# Download the dataset; if you are running locally, please comment out the following
await download(path, "auto.csv")
path="auto.csv"

# Import pandas library
import pandas as pd

# Read the online file by the URL provided and assign it to variable, 'df'
df = pd.read_csv(path, header=None)
```

```
print("The first 5 rows of the dataframe")
df.head(5)
```

```
The first 5 rows of the dataframe
```

	0	1	2	3	4	5	6	7	8	9	...	16	17	18	19	20	21	22	23	24	25
0	3	?	alfa-romero	gas	std	two	convertible	rwd	front	88.6	...	130	mpfi	3.47	2.68	9.0	111	5000	21	27	13495
1	3	?	alfa-romero	gas	std	two	convertible	rwd	front	88.6	...	130	mpfi	3.47	2.68	9.0	111	5000	21	27	16500
2	1	?	alfa-romero	gas	std	two	hatchback	rwd	front	94.5	...	152	mpfi	2.68	3.47	9.0	154	5000	19	26	16500
3	2	164	audi	gas	std	four	sedan	fwd	front	99.8	...	109	mpfi	3.19	3.40	10.0	102	5500	24	30	13950
4	2	164	audi	gas	std	four	sedan	4wd	front	99.4	...	136	mpfi	3.19	3.40	8.0	115	5500	18	22	17450

```
df.tail(10)
```

	0	1	2	3	4	5	6	7	8	9	...	16	17	18	19	20	21	22	23	24	25
195	-1	74	volvo	gas	std	four	wagon	rwd	front	104.3	...	141	mpfi	3.78	3.15	9.5	114	5400	23	28	13415
196	-2	103	volvo	gas	std	four	sedan	rwd	front	104.3	...	141	mpfi	3.78	3.15	9.5	114	5400	24	28	15985
197	-1	74	volvo	gas	std	four	wagon	rwd	front	104.3	...	141	mpfi	3.78	3.15	9.5	114	5400	24	28	16515
198	-2	103	volvo	gas	turbo	four	sedan	rwd	front	104.3	...	130	mpfi	3.62	3.15	7.5	162	5100	17	22	18420
199	-1	74	volvo	gas	turbo	four	wagon	rwd	front	104.3	...	130	mpfi	3.62	3.15	7.5	162	5100	17	22	18950
200	-1	95	volvo	gas	std	four	sedan	rwd	front	109.1	...	141	mpfi	3.78	3.15	9.5	114	5400	23	28	16845
201	-1	95	volvo	gas	turbo	four	sedan	rwd	front	109.1	...	141	mpfi	3.78	3.15	8.7	160	5300	19	25	19045
202	-1	95	volvo	gas	std	four	sedan	rwd	front	109.1	...	173	mpfi	3.58	2.87	8.8	134	5500	18	23	21485
203	-1	95	volvo	diesel	turbo	four	sedan	rwd	front	109.1	...	145	idi	3.01	3.40	23.0	106	4800	26	27	22470
204	-1	95	volvo	gas	turbo	four	sedan	rwd	front	109.1	...	141	mpfi	3.78	3.15	9.5	114	5400	19	25	22625

```
# Create headers list
headers = ["symboling","normalized-losses","make","fuel-type","aspiration",
"num-of-doors","body-style",
        "drive-wheels","engine-location","wheel-base",
"length","width","height","curb-weight","engine-type",
        "num-of-cylinders",
"engine-size","fuel-system","bore","stroke","compression-ratio","horsepower",
        "peak-rpm","city-mpg","highway-mpg","price"]
print("headers\n", headers)
```

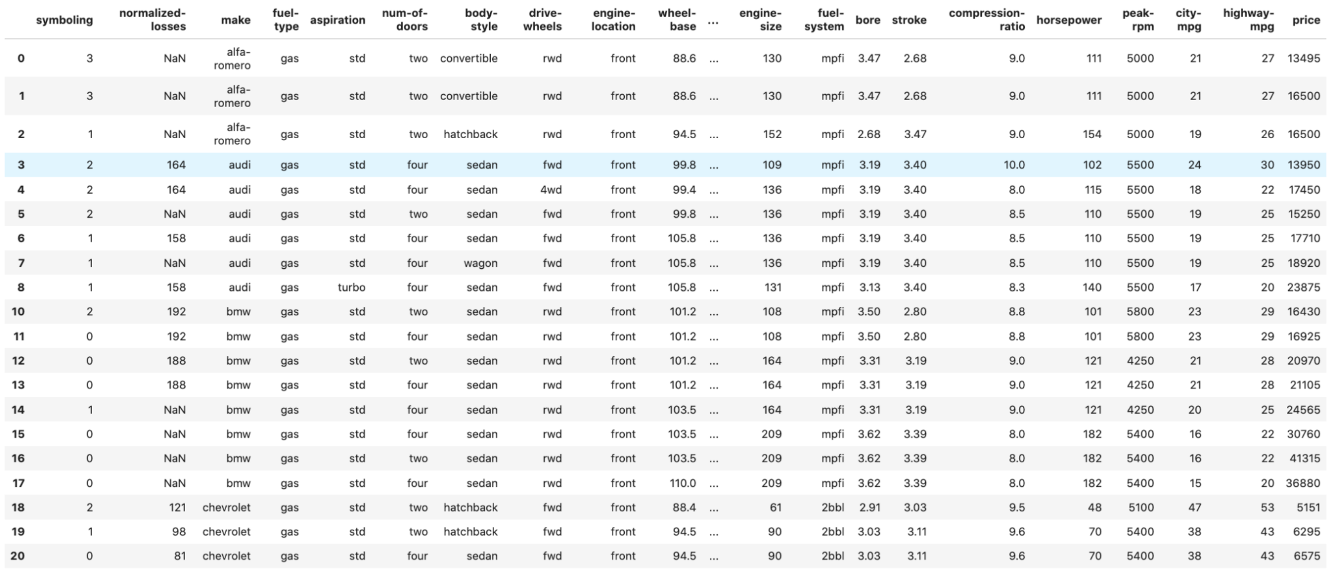
```
headers
 ['symboling', 'normalized-losses', 'make', 'fuel-type', 'aspiration', 'num-of-doors', 'body-style', 'drive-wheels', 'engine-location', 'wheel-base', 'length', 'width', 'height', 'curb-weight', '
ne-type', 'num-of-cylinders', 'engine-size', 'fuel-system', 'bore', 'stroke', 'compression-ratio', 'horsepower', 'peak-rpm', 'city-mpg', 'highway-mpg', 'price']
```

```
# Set the list of headers as the column names of the dataframe
df.columns = headers
df.head(10)
```

	symboling	normalized-losses	make	fuel-type	aspiration	num-of-doors	body-style	drive-wheels	engine-location	wheel-base	...	engine-size	fuel-system	bore	stroke	compression-ratio	horsepower	peak-rpm	city-mpg	highway-mpg	price
0	3	?	alfa-romero	gas	std	two	convertible	rwd	front	88.6	...	130	mpfi	3.47	2.68	9.0	111	5000	21	27	13495
1	3	?	alfa-romero	gas	std	two	convertible	rwd	front	88.6	...	130	mpfi	3.47	2.68	9.0	111	5000	21	27	16500
2	1	?	alfa-romero	gas	std	two	hatchback	rwd	front	94.5	...	152	mpfi	2.68	3.47	9.0	154	5000	19	26	16500
3	2	164	audi	gas	std	four	sedan	fwd	front	99.8	...	109	mpfi	3.19	3.40	10.0	102	5500	24	30	13950
4	2	164	audi	gas	std	four	sedan	4wd	front	99.4	...	136	mpfi	3.19	3.40	8.0	115	5500	18	22	17450
5	2	?	audi	gas	std	two	sedan	fwd	front	99.8	...	136	mpfi	3.19	3.40	8.5	110	5500	19	25	15250
6	1	158	audi	gas	std	four	sedan	fwd	front	105.8	...	136	mpfi	3.19	3.40	8.5	110	5500	19	25	17710
7	1	?	audi	gas	std	four	wagon	fwd	front	105.8	...	136	mpfi	3.19	3.40	8.5	110	5500	19	25	18920
8	1	158	audi	gas	turbo	four	sedan	fwd	front	105.8	...	131	mpfi	3.13	3.40	8.3	140	5500	17	20	23875
9	0	?	audi	gas	turbo	two	hatchback	4wd	front	99.5	...	131	mpfi	3.13	3.40	7.0	160	5500	16	22	?

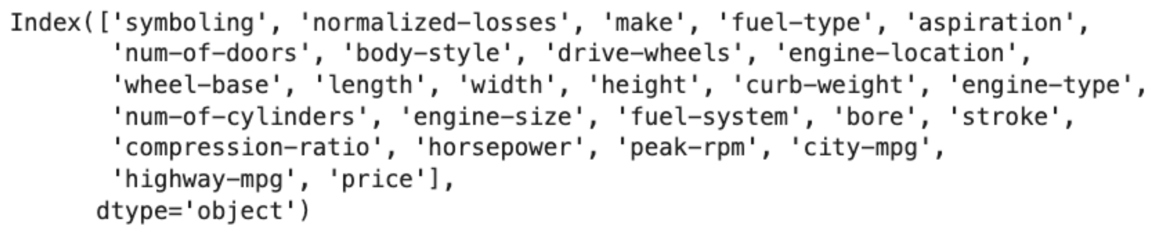
# Replace the "?" symbol with NaN so the dropna() can remove the missing values
df1=df.replace('?',np.NaN)

# Drop missing values along the column ‘price’
df=df1.dropna(subset=["price"], axis=0)
df.head(20)



	symboling	normalized-losses	make	fuel-type	aspiration	num-of-doors	body-style	drive-wheels	engine-location	wheel-base	...	engine-size	fuel-system	bore	stroke	compression-ratio	horsepower	peak-rpm	city-mpg	highway-mpg	price
0	3	NaN	alfa-romero	gas	std	two	convertible	rwd	front	88.6	...	130	mpfi	3.47	2.68	9.0	111	5000	21	27	13495
1	3	NaN	alfa-romero	gas	std	two	convertible	rwd	front	88.6	...	130	mpfi	3.47	2.68	9.0	111	5000	21	27	16500
2	1	NaN	alfa-romero	gas	std	two	hatchback	rwd	front	94.5	...	152	mpfi	2.68	3.47	9.0	154	5000	19	26	16500
3	2	164	audi	gas	std	four	sedan	fwd	front	99.8	...	109	mpfi	3.19	3.40	10.0	102	5500	24	30	13950
4	2	164	audi	gas	std	four	sedan	4wd	front	99.4	...	136	mpfi	3.19	3.40	8.0	115	5500	18	22	17450
5	2	NaN	audi	gas	std	two	sedan	fwd	front	99.8	...	136	mpfi	3.19	3.40	8.5	110	5500	19	25	15250
6	1	158	audi	gas	std	four	sedan	fwd	front	105.8	...	136	mpfi	3.19	3.40	8.5	110	5500	19	25	17710
7	1	NaN	audi	gas	std	four	wagon	fwd	front	105.8	...	136	mpfi	3.19	3.40	8.5	110	5500	19	25	18920
8	1	158	audi	gas	turbo	four	sedan	fwd	front	105.8	...	131	mpfi	3.13	3.40	8.3	140	5500	17	20	23875
10	2	192	bmw	gas	std	two	sedan	rwd	front	101.2	...	108	mpfi	3.50	2.80	8.8	101	5800	23	29	16430
11	0	192	bmw	gas	std	four	sedan	rwd	front	101.2	...	108	mpfi	3.50	2.80	8.8	101	5800	23	29	16925
12	0	188	bmw	gas	std	two	sedan	rwd	front	101.2	...	164	mpfi	3.31	3.19	9.0	121	4250	21	28	20970
13	0	188	bmw	gas	std	four	sedan	rwd	front	101.2	...	164	mpfi	3.31	3.19	9.0	121	4250	21	28	21105
14	1	NaN	bmw	gas	std	four	sedan	rwd	front	103.5	...	164	mpfi	3.31	3.19	9.0	121	4250	20	25	24565
15	0	NaN	bmw	gas	std	four	sedan	rwd	front	103.5	...	209	mpfi	3.62	3.39	8.0	182	5400	16	22	30760
16	0	NaN	bmw	gas	std	two	sedan	rwd	front	103.5	...	209	mpfi	3.62	3.39	8.0	182	5400	16	22	41315
17	0	NaN	bmw	gas	std	four	sedan	rwd	front	110.0	...	209	mpfi	3.62	3.39	8.0	182	5400	15	20	36880
18	2	121	chevrolet	gas	std	two	hatchback	fwd	front	88.4	...	61	2bbl	2.91	3.03	9.5	48	5100	47	53	5151
19	1	98	chevrolet	gas	std	two	hatchback	fwd	front	94.5	...	90	2bbl	3.03	3.11	9.6	70	5400	38	43	6295
20	0	81	chevrolet	gas	std	four	sedan	fwd	front	94.5	...	90	2bbl	3.03	3.11	9.6	70	5400	38	43	6575

print(df.columns)



```
Index(['symboling', 'normalized-losses', 'make', 'fuel-type', 'aspiration',
       'num-of-doors', 'body-style', 'drive-wheels', 'engine-location',
       'wheel-base', 'length', 'width', 'height', 'curb-weight', 'engine-type',
       'num-of-cylinders', 'engine-size', 'fuel-system', 'bore', 'stroke',
       'compression-ratio', 'horsepower', 'peak-rpm', 'city-mpg',
       'highway-mpg', 'price'],
      dtype='object')
```

# Save the dataframe as a csv file on your local machine
df.to_csv("automobile.csv", index=False)

# Display the datatypes of the dataframe
df.dtypes

```
symboling              int64
normalized-losses     object
make                  object
fuel-type             object
aspiration            object
num-of-doors          object
body-style            object
drive-wheels          object
engine-location       object
wheel-base           float64
length               float64
width                float64
height               float64
curb-weight            int64
engine-type           object
num-of-cylinders      object
engine-size            int64
fuel-system           object
bore                  object
stroke                object
compression-ratio    float64
horsepower            object
peak-rpm              object
city-mpg               int64
highway-mpg            int64
price                 object
dtype: object
```

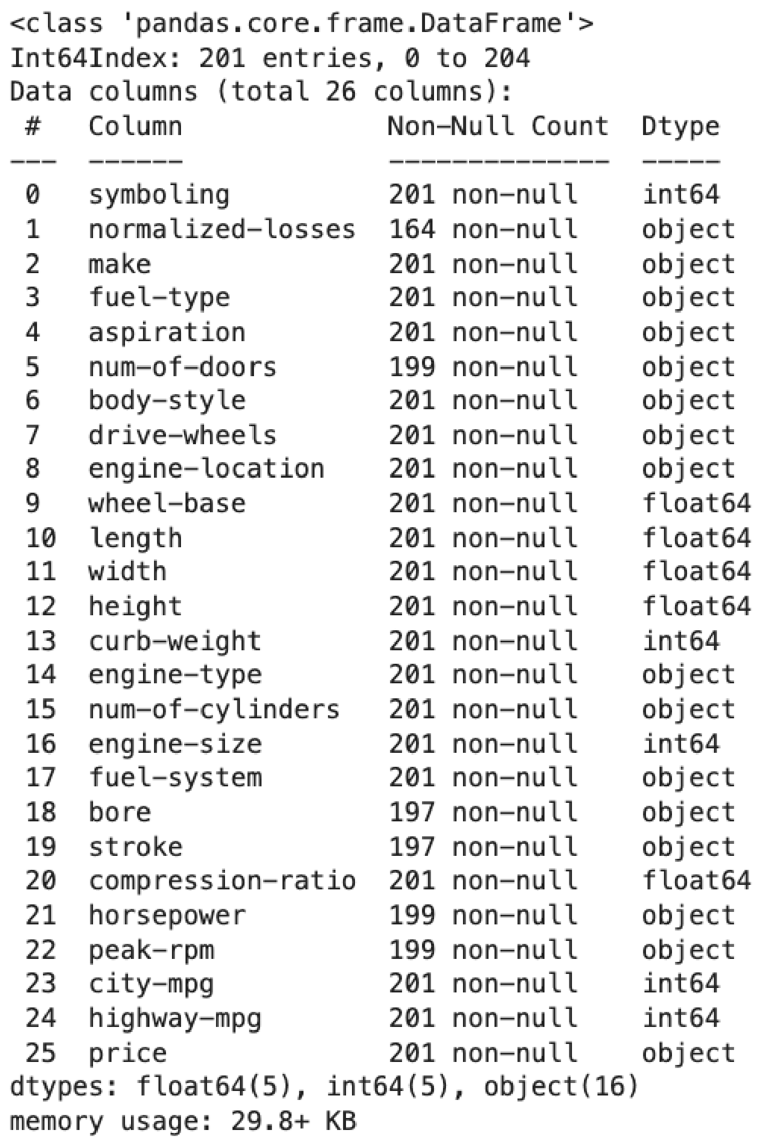
# Get a statistical summary of each column in the dataframe
dataframe.describe()

	symboling	wheel-base	length	width	height	curb-weight	engine-size	compression-ratio	city-mpg	highway-mpg
count	201.000000	201.000000	201.000000	201.000000	201.000000	201.000000	201.000000	201.000000	201.000000	201.000000
mean	0.840796	98.797015	174.200995	65.889055	53.766667	2555.666667	126.875622	10.164279	25.179104	30.686567
std	1.254802	6.066366	12.322175	2.101471	2.447822	517.296727	41.546834	4.004965	6.423220	6.815150
min	-2.000000	86.600000	141.100000	60.300000	47.800000	1488.000000	61.000000	7.000000	13.000000	16.000000
25%	0.000000	94.500000	166.800000	64.100000	52.000000	2169.000000	98.000000	8.600000	19.000000	25.000000
50%	1.000000	97.000000	173.200000	65.500000	54.100000	2414.000000	120.000000	9.000000	24.000000	30.000000
75%	2.000000	102.400000	183.500000	66.600000	55.500000	2926.000000	141.000000	9.400000	30.000000	34.000000
max	3.000000	120.900000	208.100000	72.000000	59.800000	4066.000000	326.000000	23.000000	49.000000	54.000000

# Get a FULL statistical summary (includes object-type attributes ‘unique’, ‘top’, and ‘freq’)
df.describe(include = "all")

	symboling	normalized-losses	make	fuel-type	aspiration	num-of-doors	body-style	drive-wheels	engine-location	wheel-base	...	engine-size	fuel-system	bore	stroke	compression-ratio	horsepower	peak-rpm	city-mpg	highway-mpg	price
count	201.000000	164	201	201	201	199	201	201	201	201.000000	...	201.000000	201	197	197	201.000000	199	199	201.000000	201.000000	201
unique	NaN	51	22	2	2	2	5	3	2	NaN	...	NaN	8	38	36	NaN	58	22	NaN	NaN	186
top	NaN	161	toyota	gas	std	four	sedan	fwd	front	NaN	...	NaN	mpfi	3.62	3.40	NaN	68	5500	NaN	NaN	8921
freq	NaN	11	32	181	165	113	94	118	198	NaN	...	NaN	92	23	19	NaN	19	36	NaN	NaN	2
mean	0.840796	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	98.797015	...	126.875622	NaN	NaN	NaN	10.164279	NaN	NaN	25.179104	30.686567	NaN
std	1.254802	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	6.066366	...	41.546834	NaN	NaN	NaN	4.004965	NaN	NaN	6.423220	6.815150	NaN
min	-2.000000	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	86.600000	...	61.000000	NaN	NaN	NaN	7.000000	NaN	NaN	13.000000	16.000000	NaN
25%	0.000000	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	94.500000	...	98.000000	NaN	NaN	NaN	8.600000	NaN	NaN	19.000000	25.000000	NaN
50%	1.000000	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	97.000000	...	120.000000	NaN	NaN	NaN	9.000000	NaN	NaN	24.000000	30.000000	NaN
75%	2.000000	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	102.400000	...	141.000000	NaN	NaN	NaN	9.400000	NaN	NaN	30.000000	34.000000	NaN
max	3.000000	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	120.900000	...	326.000000	NaN	NaN	NaN	23.000000	NaN	NaN	49.000000	54.000000	NaN

# Get information including the index dtype and columns, non-null values and memory usage
df.info()



```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 201 entries, 0 to 204
Data columns (total 26 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   symboling          201 non-null    int64
 1   normalized-losses  164 non-null    object
 2   make               201 non-null    object
 3   fuel-type          201 non-null    object
 4   aspiration         201 non-null    object
 5   num-of-doors       199 non-null    object
 6   body-style         201 non-null    object
 7   drive-wheels       201 non-null    object
 8   engine-location    201 non-null    object
 9   wheel-base         201 non-null    float64
 10  length             201 non-null    float64
 11  width              201 non-null    float64
 12  height             201 non-null    float64
 13  curb-weight        201 non-null    int64
 14  engine-type        201 non-null    object
 15  num-of-cylinders   201 non-null    object
 16  engine-size        201 non-null    int64
 17  fuel-system        201 non-null    object
 18  bore               197 non-null    object
 19  stroke             197 non-null    object
 20  compression-ratio  201 non-null    float64
 21  horsepower         199 non-null    object
 22  peak-rpm           199 non-null    object
 23  city-mpg           201 non-null    int64
 24  highway-mpg        201 non-null    int64
 25  price              201 non-null    object
dtypes: float64(5), int64(5), object(16)
memory usage: 29.8+ KB
```